

NOAA Scientific Publications Report: April 20- May 4, 2012

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HIGHLIGHTED ARTICLES

1. Title: *Re-creating missing population baselines for Pacific reef sharks*

Journal: *Conservation Biology*

Authors: Marc Nadon, Julia Baum, Ivor Williams, Jana McPherson, Brian Zgliczynski, **Benjamin Richards (NMFS Pacific Islands Fisheries Science Center), Robert Schroeder (NMFS Pacific Islands Regional Office), Russell Brainard (NMFS Pacific Islands Fisheries Science Center)**

Expected publication date: 26 April 2012, online

Summary: The density of reef sharks has declined to 3–10% of baseline levels in Hawaii, American Samoa, and the Marianas. Simulated baseline densities of reef sharks under the absence of humans were 1.1–2.4/ha for the main Hawaiian Islands, 1.2–2.4/ha for inhabited islands of American Samoa, and 0.9–2.1/ha for inhabited islands in the Mariana Archipelago. The densities of gray reef sharks (*Carcharhinus amblyrhynchos*), whitetip reef sharks (*Triaenodon obesus*), and the group “all reef sharks” are heavily influenced by humans and their density increased substantially as human population decreased and as primary productivity and minimum sea surface temperature increased. The authors also found no evidence of inverted biomass pyramids (predator biomass greater than prey biomass) reported by other researchers for pristine reefs. The authors used data from 1607 towed-diver surveys (>1 ha transects surveyed by observers towed behind a boat) conducted at 46 reefs in the central-western Pacific Ocean, reefs that included some of the world’s most pristine coral reefs.

Important conclusions:

- The authors maintain that increasing the abundance of reef sharks around populated islands would likely require a concerted ecosystem-level effort aimed at reducing exploitation of both sharks and their prey and identifying and protecting critical habitats.
- The main factor currently sustaining the high reef shark densities recorded around some islands appears to be geographic isolation.
- While the recently-established marine national monuments at most isolated U.S. Pacific islands may substantially increase the probability of persistence of reef shark populations, the authors assert that effective enforcement and additional fishing regulations elsewhere would also be necessary to slow the decline of these species.

Significance of scientific conclusions for management, policy or to the broader scientific community:

- Ecosystem-based management of coral reef fisheries requires consideration of fishery effects on top-level predators in the ecosystem, including reef sharks.

Press release: Journal Press release; Picked up by CNN, MSNBC, others especially in HI.

2. Title of paper: *What are we Protecting? Fisher Behavior and the Unintended Consequences of Spatial Closures as a Fishery Management Tool*

Journal: Ecological Applications

Link to full text paper: <http://www.esajournals.org/doi/pdf/10.1890/11-1319.1>

Expected publication date: May 2012

Authors: Joshua K. Abbott and Alan C. Haynie (NMFS Alaska Fisheries Science Center)

Summary:

- Spatial closures (e.g.MPAs) are prominent tools for ecosystem-based management in fisheries; however, the adaptive behavior of fishermen, to MPAs may upset the balance of fishing impacts across species.
- We use data before and after the implementation of large spatial closures in a North Pacific trawl fishery to show how closures designed for red king crab protection spurred dramatic increases in Pacific halibut bycatch due to direct displacement of fishermen and indirect effects of fishermen's adaptive behavior.
- We identify aspects of the ecological and economic context of the fishery that contributed to these surprising behaviors, noting that many multispecies fisheries are likely to share these features.
- Our results highlight the need to either anticipate the behavioral adaptations of fishermen across multiple species in reserve design (a form of implementation error) or to design management systems that are robust to these adaptations.
- Failure to do so may yield patterns of fishing effort and mortality that undermine the broader objectives of multispecies management and potentially alter ecosystems in profound ways.

Degree of controversy: Moderate – The paper shows that there can be unintended negative consequences from MPAs, which is not a new idea but may be controversial to MPA advocates.

Press release: None planned

3. Title: *A Novel Antibody-Based Biomarker for Chronic Algal Toxin Exposure and Sub-Acute Neurotoxicity*

Journal: PLoS ONE

Expected publication date: April 2012

Authors: K. A. Lefebvre, E. R. Frame, F. Gulland, J. D. Hansen, P. S. Kendrick (NMFS-Northwest), R. P. Beyer, T. K. Bammiller, F. M. Farin, E. Hiolski, D. Smith, D. J. Marcinek

Summary: Domoic acid (DA), is naturally produced by marine phytoplankton and presents a significant threat to the health of marine mammals, seabirds and humans via

transfer of the toxin through the foodweb. In humans, acute exposure causes a neurotoxic illness characterized by seizures, memory loss, coma and death. Regular monitoring for high DA levels in edible shellfish tissues has been effective in protecting human consumers from acute DA exposure. However, chronic low-level DA exposure remains a concern, particularly in coastal and tribal communities that harvest shellfish known to contain low toxin levels. Domoic acid exposure via consumption of planktivorous fish also has a profound health impact on California sea lions. We discovered a novel DA-specific antibody response that is a signature of chronic low-level exposure identified initially in a zebrafish model and confirmed in naturally exposed wild sea lions. Additionally, we found that chronic exposure in zebrafish caused increased neurologic sensitivity to DA, revealing that repetitive exposure to DA well below the threshold for acute behavioral toxicity has underlying neurotoxic consequences. The discovery that chronic exposure to low levels of a single amino acid triggers a detectable antibody response is surprising and has profound implications for the development of diagnostic tests for exposure to other pervasive environmental toxins.

Important conclusions: Repetitive exposure to low levels of a common algal toxin (domoic acid) causes an antibody response in a zebrafish model organism. This antibody is a biomarker for exposure and was also detected in naturally exposed California sea lions, thereby ensuring that the antibody response does occur in mammals. Chronic low-level exposure led to increased toxin sensitivity in zebrafish, suggesting a negative health consequence of low-level exposure.

Significance: As toxin presence continues to increase in the environment, there is a critical need for the development of diagnostic tests for identifying chronic domoic acid exposure in “at-risk” human and wildlife populations. This discovery provides a potential tool for the development of a blood test that can be used to monitor exposure and health risks related to chronic low-level exposure.

Press Release: Yes.

4. **Title:** *Finding Balance in Fisheries Management*

A letter to the editor in response to “*Reconsidering the consequences of selective fisheries*”

Journal: *Science (Policy forum)*

Authors: Sara M. Maxwell, **Elliott L. Hazen (NMFS Southwest Fisheries Science Center)**, Lance E. Morgan, Helen Bailey, Rebecca Lewison

Publication date: 27 April 2012

Summary: S. M. Garcia *et al.* (“Reconsidering the consequences of selective fisheries,” *Science Policy Forum*, 2 March 2012, p. 1045) presented a valuable framework for considering how balanced fisheries harvest could improve ecosystem status. Balanced

fisheries distribute a moderate mortality from fishing across the widest possible range of species, stocks, and sizes in an ecosystem, in proportion to their natural productivity, so that the relative size and species composition is maintained. Maxwell *et al.* argue against the utility of a balanced fisheries approach put forth by Garcia *et al.* in a letter to the editor; important conclusions are below.

Important conclusions:

- True EBM requires not just balanced fishing, but balanced management of risk across multiple sectors (e.g., integrated ecosystem assessments) to ensure population viability for all species and healthy ecosystems.
- There will always be an added need to protect long-lived, slow-maturing, low-fecundity species that are targeted or affected by fishing.

Significance of scientific conclusions for management and policy:

- Balanced fishing is not practical as a policy because fisheries target high-value resources; new economic and social incentives for consumption are required to make balanced fishing a reality.
- Balanced fishing is only part of an EBM approach that should consider multiple uses across all sectors.

Press release: None planned

ALL OTHER ARTICLES

TOP TIER JOURNALS

Title: *Revealing the Marine Aquarium Fish Trade's Appetite for Biodiversity*

Journal: PlosOne

Authors and affiliations: Andrew L. Rhyne(New England Aquarium, Williams University), Michael F. Tlusty (New England Aquarium), Pamela J. Schofield (US Geological Survey), Les Kaufman (New England Aquarium, Boston University Marine Program, Conservation International), **James A. Morris, Jr.(NOAA, NOS, NCCOS)** & Andrew W. Bruckner (Khaled bin Sultan Living Oceans, Foundation)

Expected publication date: May 2012

Summary: The aquarium trade and other wildlife consumers are at a crossroads forced by threats from global climate change and other anthropogenic stressors which have weakened coastal ecosystems. There are valid concerns about the additional stress brought on by the coral reef wildlife trade. However, the coral reef wildlife trade brings income into impoverished parts of the world, and stimulates interest in marine conservation in affluent nations. Can this trade provide a sustainable income source for small island economies? Can exporting and importing nations manage this trade to ensure that it is not destroying the most biodiverse area on the planet? Answers to these questions require data and currently there is only very limited information on which to base decisions. Here, we examine an entire year of import records from the invoices attached to the shipments of marine tropical fish entering the United States. We report that biodiversity levels are much higher than any previous estimates and more than 50% of government importation forms have numerical or other reporting errors resulting in the overestimation of trade volumes. Finally, we examined the relationship between trade volume, biodiversity and introduction of exotic species. This is the first study of aquarium trade imports to compare commercial invoices to government forms and provides a means to routinely and in real time, examine the biodiversity of the trade in coral reef wildlife species.

Important conclusions:

1. Biodiversity levels of imported fish species are much higher than previously estimated
2. More than 50% of government importation forms have numerical or other reporting errors resulting in overestimation of trade volumes.
3. Exotic species introductions do not appear to be directly correlated with trade volume.

Significance: This research significantly alters the understanding of the marine aquarium trade's demand for biodiversity and the need for better reporting and data management of importation records. This research also illuminates the need to better

understand drivers influencing the introduction of non- native marine ornamental species into coastal U.S. waters. Nearly 40 ornamental species have been reported in the coastal waters of South Florida in the last decade. These introductions do not appear to correlated well importation volume but could be due to other cultural or economic reasons.

INTERMEDIATE-TIER JOURNALS

Title: *Range and Primary Habitats of Hawaiian Insular False Killer Whales: An Assessment to Inform Determination of “Critical Habitat”*

Journal: *Endangered Species Research*

Authors and affiliations: Robin W. Baird (Cascadia Research Collective), **M. Bradley Hanson (NMFS-NWFSC)**, Gregory S. Schorr (Cascadia Research Collective), Daniel L. Webster (Cascadia Research Collective), Daniel J. McSweeney (Wild Whale Research Foundation), **Antoinette M. Gorgone (NMFS-SEFSC)**, Sabre D. Mahaffy (Cascadia Research Collective), **Damon Holzer (NMFS-NWFSC)**, **Erin M. Oleson (NMFS-PIFSC)**, Russel D. Andrews (University of Alaska Fairbanks/Alaska SeaLife Center)

Expected publication date: May-June 2012

Abstract: In November 2010, NMFS proposed listing a small demographically isolated population of false killer whales in Hawai‘i as Endangered but has not proposed designating critical habitat. We assessed the population’s range and heavily used habitat areas using data from 27 satellite tags deployed. Assessment indicated 22 “groups” with data available from 13 to 105 days with 8513 locations. Analyses of photo-identification data indicated the population is divided into three large associations of individuals (social clusters), with tag data from two. Ranges for these two clusters were similar, although one used significantly deeper waters, and their high use areas differed. A minimum convex polygon range encompassing all locations was ~82800 km², with individuals ranging from Ni‘ihau to Hawai‘i Island from < 1 km to 122 km offshore. Three high-use areas were identified: 1) off the north half of Hawai‘i Island; 2) north of Maui and Moloka‘i; and 3) southwest of Lana‘i. While this analysis provides information useful for decision-making concerning designation of critical habitat, there are likely other high use areas that have not yet been identified due to seasonal limitations and availability of data from only two of the three main social clusters.

Significance: Based on observer data, NMFS has concluded that the Hawaii-based deep set pelagic longline fishery interacts with Hawaiian false killer whales occurring within the insular stock zone in the main Hawaiian Islands (0-140 km from shore), which encompasses the high-use areas identified in this article.

Title: *Fragment viability and reproductive status of the invasive colonial tunicate Didemnum vexillum*

Journal: *Biological Invasions*

Authors: **James A. Morris, Jr (NOS)**, and Mary Carmen (WHOI)

Expected publication date: May 2012

Important conclusions:

- The invasive colonial tunicate *Didemnum vexillum* can survive and reproduce while in a fragmented state.
- Fragmentation caused by activities such as dredging and defouling of commercial gear and boats is likely exacerbating the spread of invasive *D. vexillum*.
- *D. vexillum* fragments are capable of changing shape from flat to round spheres likely a mechanism used to protect colony and facilitate dispersal.

Significance: This research provides strong evidence that fragmentation of *D. vexillum* colonies by humans has likely facilitated the spread of this invasive species. Managers should consider how fragmentation may affect the future spread of *D. vexillum*.

Title: *Reconciling conflict between the direct and indirect effects of marine reserve protection*

Journal: Environmental Conservation

Expected Publication Date: April 16, 2012

Authors: Nick T. Shears, David J. Kushner, **Stephen L. Katz (NMFS)**, Steven D. Gaines.

Summary: No-take marine reserves directly promote the recovery of predatory species, which can have negative indirect effects on prey populations in reserves. When harvesting also occurs on prey species there is potential conflict between the direct and indirect effects of protection, and reserves may not have conservation benefits for prey species. For example, sea urchins are fished in many regions, but may decline in reserves due to increased predation rates. To investigate this potential conflict, this paper compares density, size, biomass and reproductive potential of both a harvested and an unharvested urchin species between a long-term reserve and unprotected sites in California. Consistent with density-mediated indirect interactions, densities of the unharvested species were 3.4-times higher at unprotected sites compared to reserve sites. However, for the harvested species, densities were comparable between reserves and unprotected sites. Both species were consistently larger at reserve sites, and the biomass and reproductive potential of the harvested species was 4.8- and 7.0-times higher, respectively, than at unprotected sites. This is likely due to differences in size-selectivity between harvesting and predators, and potential compensatory effects of predators.

Important Conclusions: We put marine reserves in to protect impacted populations, but when we harvest those populations' forage, the marine reserves are not protecting the forage species. This presents a potential conflict of use on the regional or ecosystem scale.

Significance: Has implications for MPA effectiveness and ecosystem-level assessment.

Title: *Pelagic predator associations: tuna and dolphins in the eastern tropical Pacific Ocean*

Journal: Marine Ecology Progress Series

Expected publication date: June-August, 2012

Authors (NOAA authors in bold): Michael D. Scott, **Susan J. Chivers**, Robert J. Olson, **Paul C. Fiedler** and Kim Holland (**both at NMFS Southwest Fisheries Science Center**)

Summary: The association of yellowfin tuna and pantropical spotted dolphins in the eastern tropical Pacific Ocean (ETP) has been exploited by tuna fishermen and has intrigued scientists for decades, yet we still have questions about what the benefits of the association are, whether the association is obligatory or facultative, why the tuna are most often found with spotted dolphins, and why the species associate most strongly in the ETP. This paper reviews several hypotheses and present results from three studies: a simultaneous tracking study of spotted dolphins and yellowfin tuna, food web study comparing their prey and daily foraging patterns, and a spatial study of oceanographic features correlated with the tuna-dolphin association. These studies demonstrate that the association is neither permanent nor obligatory and that the benefits of the association are not based on feeding advantages. However, they do support the hypothesis that one or both species reduce the risk of predation by forming large, mixed-species groups. The association is most prevalent where the habitat of the tuna is suppressed into the warm, shallow, surface waters due to regions of low oxygen. The association has been observed in other oceans with similar oceanographic conditions, but it is most prevalent and consistent in the ETP where the oxygen minimum zone is the most hypoxic and extensive in the world.

Important conclusions: (1) The tuna-dolphin association is neither permanent nor obligatory, (2) the benefits are not based on feeding advantages, (3) the association is most prevalent where the habitat of tuna suppressed due to regions of low oxygen, and (4) one or both species reduce the risk of predation by forming large, mixed-species groups.

Significance: This is a comprehensive assessment of a question that has long been posed by marine mammal and fisheries scientists, and by tuna fishermen.

REGIONAL/HIGHLY SPECIALIZED JOURNALS

Title: Predicting Hurricane Intensity and Structure Changes Associated with Eyewall Replacement Cycles

Journal: Weather and Forecasting

Authors and affiliations: Dr. James P. Kossin (NESDIS/NCDC); Matthew Sitkowski (University of Wisconsin—Madison)

Expected publication date: April 2012 (*Volume 27, Issue 2, pp 484-488*)

Significance: To address a deficiency in forecasting of tropical cyclone eyewall replacement cycles, the authors used large archives of geostationary and microwave satellite data available at NCDC, in combination with aircraft reconnaissance data, to create a new suite of statistical models that predict the onset of an eyewall replacement cycle and the associated changes in intensity and size, such as amplitude and timing of the intensity fluctuations and fluctuations of the wind structure which can provide real-time operational objective guidance to forecasters.

****One of the models is now being run operationally at NOAA/NHC, and the others will be transitioned to operations this year.**

Press release: NCDC prepared a “News Item” that may be released via social media

Title: Resistance to alternative management in fisheries - Economic and cultural considerations of North Carolina’s commercial fishers

Journal: Politics and the Life Sciences

Expected publication date: Spring 2012

Authors: Scott Crosson (NMFS Southeast Fisheries Science Center)

Abstract: Research in recent decades has shown that although conventional fisheries management can provide sufficient biological protection to fisheries stocks, it does not necessarily lead to satisfactory social or economic outcomes. In its stead, the merits and shortcomings of a variety of alternate management systems have been proposed, implemented, and analyzed in recent years. There have been few investigations, however, of actual fishers’ preferences between different management systems.

Integrating results from a survey of North Carolina commercial fishers with their individual harvest histories and sociodemographic profiles shows that economic and cultural variables both play a significant role. I introduce the use of the Herfindahl-Hirschman Index (HHI) as an individual measurement of diversity in harvest and demonstrate that it is associated with management preferences. Social and family factors were also notable indicators.

Significance of scientific conclusions for management, policy or to the broader scientific community: Certain social and economic indicators may be predictive of commercial fisher's attitudes towards switching management to catch shares or ITQs.

Title: Management reference points to account for direct and indirect impacts of fishing on marine mammals.

Journal: Marine Mammal Science

Expected publication date: Late 2012

Author: Jeffrey Moore (NMFS Southwest Fisheries Science Center)

Summary: Regulations developed under the Marine Mammal Protection Act (MMPA) address reduction in marine mammal population due to direct mortality events (caught in nets, hit by boats, etc.) but it does not account for indirect mortality due to prey depletion from fishing. This paper proposes a more complete assessment of marine mammal mortality using a measurement for generalized Potential Biological Removal (PBR*) which would include prey depletion as a cause of mortality. The authors hypothesize that PBR* can help identify when indirect fishing effects (alone, or combination with direct mortality estimates) may stymie MMPA objectives, and could inform catch limit estimates for target species that are also important as marine mammal prey. This paper utilizes PBR* in a case study to evaluate the possible combined direct + indirect effects of fishing on cetaceans in northeastern U.S. waters. Based on this analysis, increased risk of marine mammal depletion due to indirect fishing effects was not evident, although this result must be interpreted cautiously given

limited understanding of cetacean diets and marine food web dynamics. This study is intended to illustrate a possible practical approach for incorporating indirect fisheries impacts on marine mammals into a comprehensive management framework, and it raises several scientific and policy issues that merit further investigation.

Important conclusion: Generalizes the MMPA's Potential Biological Removal (PBR) framework to account for indirect fisheries impacts in the form of reduced carrying capacity from prey depletion.

Significance for management: Raises several scientific and policy issues that merit investigation as we attempt to implement an ecosystem approach to fisheries management. Reference points can help implement an ecosystem approach to fisheries management by establishing precautionary removal limits for non-target species and target species of ecological importance.

ALL OTHERS (BOOK CHAPTERS and REPORTS)

1. *Incorporating Sea Level Change Scenarios at the Local Level*

Link to full text paper: <http://www.csc.noaa.gov/publications/slcscenarios.pdf>

Authors: Doug Marcy (lead) (NOS CSC), Allison Allen (NOS CO-OPS), William Sweet (NOS COOP&SVC), Stephen Gill (NOS CO-OPS), Audra Luscher-Aissaoui (NOS CSC), Edward Myers (NOS OCS), Chris Zervas (NOS COOP&SVC).

2. *California Hatchery Review Statewide Report (NMFS Southwest Fisheries Science Center)*. Report prepared for the US Fish and Wildlife Service and Pacific Marine Fisheries Commission. California Hatchery Review Statewide Report

Acceptance date: April 2012

Authors: California Hatchery Scientific Review Group (California HSRG): **Garza C**, Hamelberg S, Hankin D, Lacy M, Lee D, May B, **Mohr M**, Nandor G, Niemela K, Reisenbichler R, True K

3. *Protecting the Public Interest through the National Coastal Zone Management Program: How Coastal States and Territories Use No-Build Areas along Ocean and Great Lake Shorefronts*

Expected publication date: April/May

Authors: Christa Rabenold (NOS, Office of Ocean and Coastal Resource Management (OCRM), Coastal Programs Division)

4. *National Coastal Condition Report (NCCR IV)- EPA Publication*

Publication online: <http://water.epa.gov/type/oceb/assessmonitor/nccr/index.cfm>

Authors: EPA: Greg Colianni, Jim Casey, Virginia Engle, James Harvey, Linda Harwell, John Kiddon, John Macauley, Walt Nelson, Eric Osantowski, Lisa Smith, Kevin Summers, Marysia Szymkowiak

NOAA: **Marie-Christine Aquarone** (National Marine Fisheries Service, LME Program), **Len Balthis** (National Ocean Service, NCCOS), **Cindy Cooksey** (National Ocean Service,

NCCOS), **Jeff Hyland** (National Ocean Service, NCCOS), **Kenneth Sherman** (National Marine Fisheries Service, Narragansett, RI), **Rebecca Shuford** (National Ocean Service, Office of Science and Technology), **David Whittall** (National Ocean Service, NCCOS), FWS: Thomas Dahl, USGS: Pete Bourgeois

5. *NOAA's Ocean Circulation and Predictive Modeling Study of Two Sea-Disposed Military Munitions Sites in Hawaii: Ordnance Reef – HI-06 and HI-01 (NOS)*

Expected Publication date: June 1, 2012

Authors: **Tony Reyer, Jason Rolfe, Glen Watabayashi**, Dr. Melissa Rice, Dr. Brian Powell, Dr. Margaret McManus, Jeff Sevadjian, Dr. Ivica Janeković, Drew Rak, and Dr. Deborah Hunka

Summary: NOAA performed an ocean current and predictive modeling study to support a Department of Defense (DOD) evaluation of the potential human health hazards posed by military munitions present on the west coast of O'ahu, Hawai'i.

6. *Office of National Marine Sanctuaries Review of Artificial Reefs (NOS-ONMS)*, Office of National Marine Sanctuaries Conservation Series

Expected Publication Date: June 2012

Authors: **Kathy Broughton (ONMS)**

7. *Gray's Reef National Marine Sanctuary Condition Report Addendum*, ONMS Condition Report Series

Expected Publication Date: June 8, 2012

Authors: **Greg McFall¹, George Sedberry, Becky Shortland, Sarah Fangman, Steve Gittings, Kathy Broughton (NOS-ONMS)**